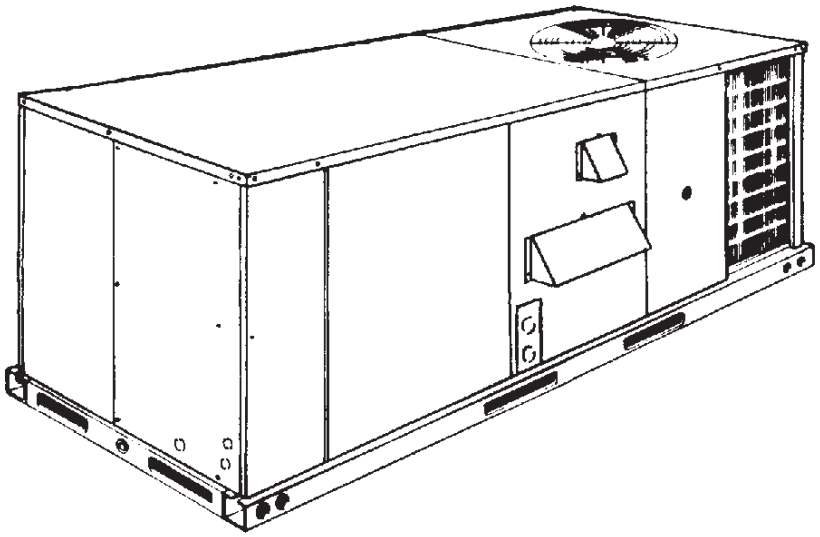
# SUNLINE 2000™
# GAS / ELECTRIC
# SINGLE PACKAGE AIR CONDITIONERS

**INSTALLATION INSTRUCTION**

Supersedes: 530.26-N2YI (1096)/035-14836-000

035-14836-001-A-0204

**MODELS D5CG 036 & 048**
**MODEL D5CG 060 & 076 BELT DRIVE**
**(WORLD 50HZ)**



ISO 9000 REGISTRATION

**FOR YOUR SAFETY**

**Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance**.

If you smell gas:
1. Open windows
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

## GENERAL

YORK Model DCG units are single package air conditioners with gas heat designed for outdoor installation on a rooftop or a slab.

The units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory-installed and tested. The units require only electric power, gas piping and duct connections at the point of installation.

The gas-fired heaters have aluminized steel tubular heat exchangers and spark ignition with intermittent pilot.

This appliance is not to be used for temporary heating of buildings or structures under construction.

## INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Refer to Form 50.15-NM for additional information.

## REFERENCE

Additional information on the design, installation, operation and service of this equipment is available in the following reference forms:

- 55.70-N1 -General Installation
- 55.70-N2 -Pre-start & Post-start Check List
- 530.18-N1.2V -Economizer Accessory
- 530.18-N1.4V -Fixed Outdoor Air Damper Accessory
- 530.18-N1.6V -Motorized Outdoor Air Damper Accy.
- 530.18-N1.8V -Coil Guard
- 530.18-N8.2V -High Altitude Accy. (Natural Gas)
- 530.18-N8.4V -Gas Piping Accessory

Renewal Parts:

- Refer to Parts Manual for complete listing of replacement parts on this equipment.

All forms referenced in this instruction may be ordered from:

**Standard Register**
**Telephone: (405)691-1126**
**Fax: (877)379-7920**

Installer should pay particular attention to the words: *NOTE, CAUTION* and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

**CAUTION**

THIS PRODUCT MUST BE INSTALLED IN STRICT COMPLIANCE WITH THE ENCLOSED INSTALLATION INSTRUCTIONS AND ANY APPLICABLE LOCAL, STATE, AND NATIONAL CODES INCLUDING, BUT NOT LIMITED TO, BUILDING, ELECTRICAL, AND MECHANICAL CODES

**WARNING**

INCORRECT INSTALLATION MAY CREATE A CONDITION WHERE THE OPERATION OF THE PRODUCT COULD CAUSE PERSONAL INJURY, PROPERTY DAMAGE AND/OR DEATH.

**WARNING**

DE-ENERGIZE THE ELECTRICAL POWER AND TURN OFF THE GAS SUPPLY TO THE UNIT BEFORE ATTEMPTING TO INSPECT, REPAIR OR PERFORM MAINTENANCE TO THE UNIT.

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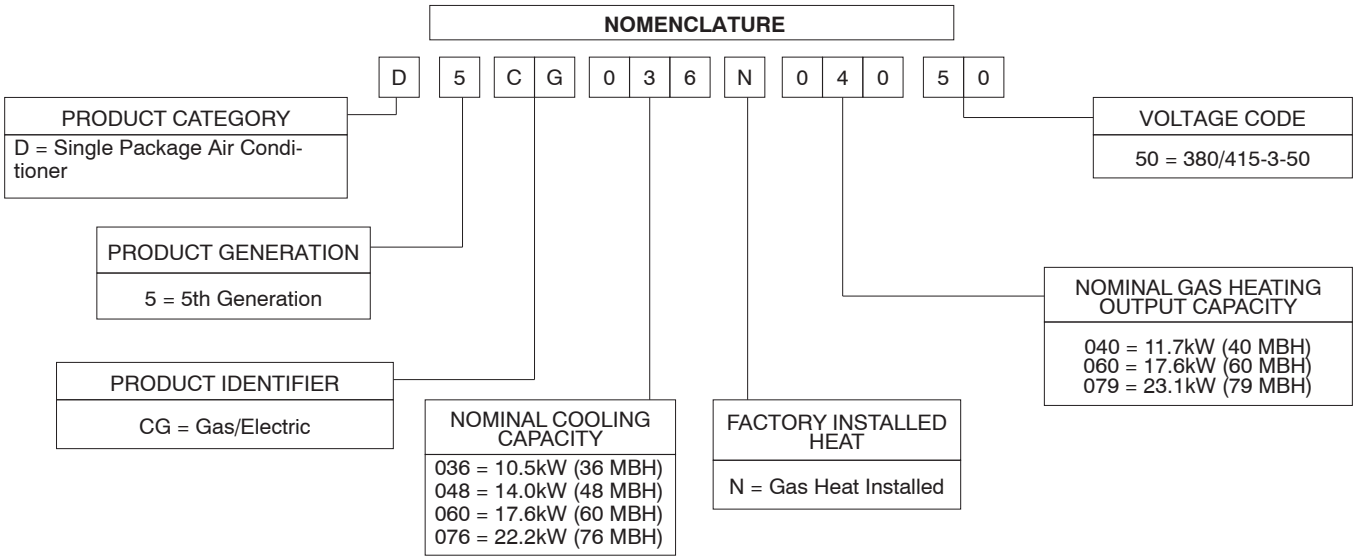

NOMENCLATURE
D 5 C G 0 3 6 N 0 4 0 5 0
PRODUCT CATEGORY
D = Single Package Air Conditioner
PRODUCT GENERATION
5 = 5th Generation
PRODUCT IDENTIFIER
CG = Gas/Electric
NOMINAL COOLING CAPACITY
036 = 10.5kW (36 MBH)
048 = 14.0kW (48 MBH)
060 = 17.6kW (60 MBH)
076 = 22.2kW (76 MBH)
FACTORY INSTALLED HEAT
N = Gas Heat Installed
NOMINAL GAS HEATING OUTPUT CAPACITY
040 = 11.7kW (40 MBH)
060 = 17.6kW (60 MBH)
079 = 23.1kW (79 MBH)
VOLTAGE CODE
50 = 380/415-3-50

# INSTALLATION

## LIMITATIONS

These units must be installed in accordance with applicable national and local safety codes.

Refer to Table 1 for Unit Application Data and to Table 2 for Gas Heat Application Data.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and / or the customer's expense.

**TABLE 1** - UNIT APPLICATION DATA

| UNIT SIZE | | 036 | 048 | 060 | 076 |
|---|---|---|---|---|---|
| Voltage Variation Min. / Max. | 380/415-3-50 | 342 / 457 | | | |
| Supply Air $m^3$/s/CFM, Nom. | | 0.57/1200 | 0.75/1600 | 0.94/2000 | 1.13/2400 |
| Wet Bulb Temperature of Air on Evaporator Coil, Min. / Max. | °C | 14 / 22 | 14 / 22 | 14 / 22 | 14 / 22 |
| | °F | 57 / 72 | 57 / 72 | 57 / 72 | 57 / 72 |
| Dry Bulb Temperature of Air on Condenser Coil, Min./ Max. | °C | 7 / 52 | 7 / 52 | 7 / 52 | 7 / 52 |
| | °F | 45 / 125 | 45 / 125 | 45 / 125 | 45 / 125 |

## LOCATION

Use the following guidelines to select a suitable location for these units.

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.

*WARNING: Excessive exposure of this furnace to contaminated combustion air may result equipment damage or personal injury. Typical contaminates include: permanent wave solutions, chlorinated waxes and cleaners, chlorine based swimming pool chemicals, water softening chemicals, carbon tetrachloride, Halogen type refrigerants, cleaning solvents (e.g. perchloroethylene), printing inks, paint removers, varnishes, hydrochloric acid, cements and glues, antistatic fabric softeners for clothes dryers, masonry acid washing materials.*

3. For ground level installation, a level pad or slab should be used. The thickness and size of the pad or slab used should meet local codes and unit weight. Do not tie the slab to the building foundation.
4. Roof structures must be able to support the weight of the unit and its options and / or accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.

*CAUTION: If a unit is to be installed on a roof curb or special frame other than a YORK roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.*

5. Maintain level tolerance to 13 mm (½ IN,) maximum across the entire length or width of the unit.
6. Elevate the unit sufficiently to prevent any blockage of the air entrances by snow in areas where there will be snow accumulation. Check the local weather bureau for the expected snow accumulation in your area.

## RIGGING AND HANDLING

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreaders, whose length exceeds the largest dimension across the unit, MUST be used across the top of the unit.

BEFORE LIFTING A UNIT, MAKE SURE THAT ITS WEIGHT IS DISTRIBUTED EQUALLY ON THE CABLES SO THAT IT WILL LIFT EVENLY.

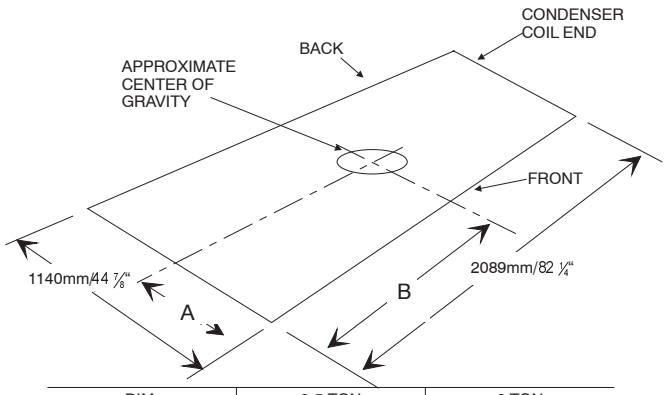
Units may also be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

LENGTH OF FORKS MUST BE A MINIMUM OF 1067 mm (42 in.).

Remove the nesting brackets from the four corners on top of the unit. All screws that are removed when taking these brackets off must be replaced on the unit.

*CAUTION: An adhesive backed label is provided over the outside of the combustion air inlet opening to prevent moisture from entering the unit which could cause damage to electrical components. Allow this closure label to remain in place until the combustion air hood is to be installed (refer to Figure 6).*

Refer to Table 4 for unit weights and to Figure 1 for approximate center of gravity.




| DIM. | 3-5 TON | 6 TON |
|---|---|---|
| A | 502mm / 19-3/4" | 559mm / 22" |
| B | 1035mm / 40-3/4" | 1118mm / 44" |

**FIG. 1** - CENTER OF GRAVITY

## CLEARANCES

All units require certain clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with applicable provisions of the local building codes. Refer to Figure 9 for the clearances required for combustible construction, servicing, and proper unit operation.

*WARNING: Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlet.*

## DUCTWORK

A closed return duct system shall be used. This shall not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize the transmission of noise.

The supply and return air duct systems should be designed for the CFM and static requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

*CAUTION: When fastening ductwork to the side duct flanges on the unit, insert the screws through the duct flanges only. DO NOT insert the screws through the casing.*

*Outdoor ductwork must be insulated and waterproofed.*

Refer to Figure 9 for information concerning side and bottom supply and return air duct openings.

## FILTERS

25.4mm (1 in.) filters are supplied with each unit. No modification to the filter racks is required to use 50.8mm (2 in.) replacement filters. Filters must always be installed ahead of the evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. Minimum filter area and required sizes are shown in Table 4.

## CONDENSATE DRAIN

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install a condensate drain line from the 20mm (¾ in.) PVC female connection on the unit to spill into an open drain.

*NOTE: The condensate drain line MUST be trapped to provide proper drainage. See Figure 2.*

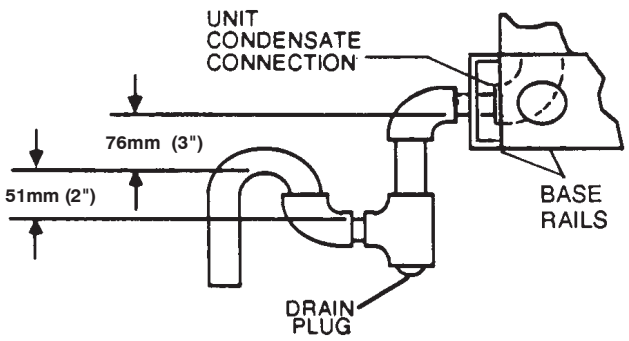



**FIG. 2** - RECOMMENDED DRAIN PIPING

## SERVICE ACCESS

Access to all serviceable components is provided by the following removable panels:

- Compressor compartment
- Burner compartment
- Blower compartment
- Main control box
- Filter compartment
- Motor access (on units with belt-drive option)

Refer to Figure 9 for location of these access panels.

*CAUTION: Make sure that all screws are replaced on the unit to maintain an air-tight seal.*

## THERMOSTAT

The room thermostat should be located on an inside wall approximately 1422 mm (56 in.) above the floor where it will not be subject to drafts, sun exposure, or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with thermostat for general installation procedure. Color coded insulated wires ([1.0 mm2] #18 AWG) should be used to connect thermostat to unit. See figure 3 for wiring details.

*NOTE: If the unit has an economizer, remove jumper J1 from terminals 8 and 10 on the relay board to prevent simultaneous operation of the scroll compressor and the economizer. If you want to energize the scroll compressor for supplemental cooling during the economizer operation, use a thermostat with two stages of cooling.*

## POWER AND CONTROL WIRING

Field wiring to the unit and electrical grounding must conform to the applicable national, and local or municipal codes.

The internal wiring harness furnished in this unit is an integral part of the unit. Field alterations to comply with electrical codes should not be required.

Voltage tolerances which must be maintained at the compressor terminals during start-up and running conditions are indicated on the unit Rating Plate and Table 1.

A fused disconnect switch should be field provided for the unit. The switch must be separate from all other circuits. Refer to Figure 9 for installation location. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram.

Electrical lines must be sized properly to carry the load. USE COPPER CONDUCTORS ONLY. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly protected.

*CAUTION: When connecting electrical power and control wiring to the unit, waterproof type connectors MUST BE USED so that water or moisture cannot be drawn into the unit during normal operation. The above waterproofing conditions will also apply when installing a field-supplied disconnect switch.*

Refer to Figure 3 for typical field wiring and to the appropriate unit wiring diagram for control circuit and power wiring information.

## BLOWER SPEED SELECTION

Three blower motor speeds are available on the direct-drive units. The speed selection for the direct-drive units is determined by the airflow and ESP requirements of the applications. All units with belt-drive have an adjustable motor pulley to achieve the above conditions.

## COMPRESSORS

The compressor in the three, four and five ton units is mounted on springs that have been tightened down for shipment only.

After the unit is installed, back out the compressor bolts until the sleeve clears the top grommet.

The six ton units are shipped with compressor mountings factory adjusted and ready for operation

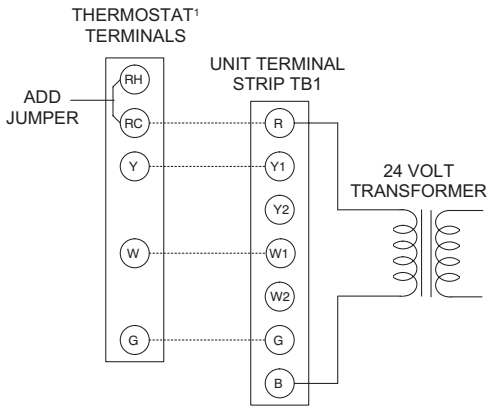
*CAUTION: Do Not loosen compressor mounting bolts.*

## COMBUSTION DISCHARGE

The products of combustion are discharged horizontally through a screened opening on the gas heat access panel.

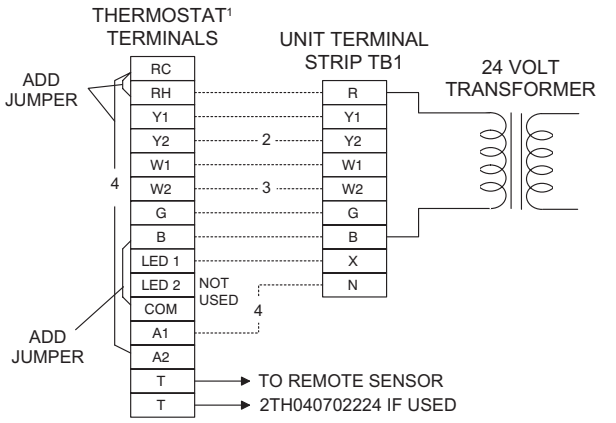
## *TYPICAL CONTROL WIRING*

COOLING/HEATING (24 VOLT THERMOSTAT)




[1]24 VOLT THERMOSTAT 2TH07701024. IF THE UNIT HAS AN ECONOMIZER, REMOVE JUMPER J1 FROM TERMINALS 8 AND 10 ON THE RELAY BOARD TO PREVENT SIMULTANEOUS OPERATION OF THE COMPRESSOR AND THE ECONOMIZER. IF YOU WANT TO CONTROL THER ECONOMIZER ON A SECOND STAGE OF COOLING OR HAVE AND ELECTRIC HEAT ACCESSORY WITH TWO STAGES OF HEAT, USE THERMOSTAT 2TH0471024

COOLING / HEATING (24 VOLT ELECTRONIC THERMOSTAT)



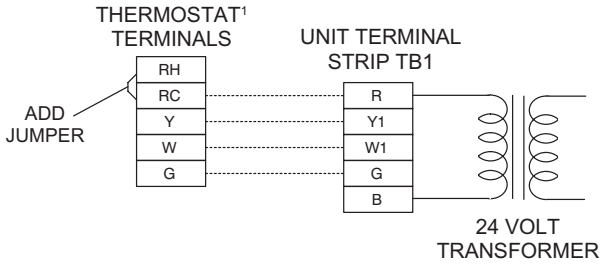

[1] ELECTRONIC PROGRAMMABLE THERMOSTAT 2ET04700224 (INCLUDES SUBBASE)

[2] SECOND STAGE COOLING IS NOT REQUIRED ON UNITS LESS ECONOMIZER.

[3] SECOND STAGE HEATING IS ONLY REQUIRED ON UNITS WITH A TWO STAGE ELECTRIC HEATER.

[4] REMOVE JUMBER J2 FROM TERMINALS 4 AND 9 ON JUMPER PLUG CONNECTOR P6 ON UNITS WITH ECONMIZER. TERMINALS A1 AND A2 PROVIDE A RELAY OUT-PUT TO CLOSE THE OUTDOOR ECONOMIZER DAMPERS WHEN THE THERMOSTAT SWITCHES TO THE SET-BACK POSITION.

COOLING / HEATING (ELECTRONIC THERMOSTAT) SINGLE STAGE




[1]ELECTRONIC PROGRAMMABLE THERMOSTAT 2ET07701024 (INCLUDES SUBBASE). IF THIS UNIT HAS AND ECONOMIZER, REMOVE JUMPER J1 FROM TERMINALS 8 AND 10 ON THE RELAY BOARD TO PREVENT SIMULTANEOUS OPERATION OF THE COMPRESSOR AND THE ECONOMIZER. IF YOU WANT TO CONTROL THE ECONOMIZER ON A SECOND STAGE OF COOLING, USE THERMOSTAT 2ET04700224.

## *TYPICAL POWER WIRING*

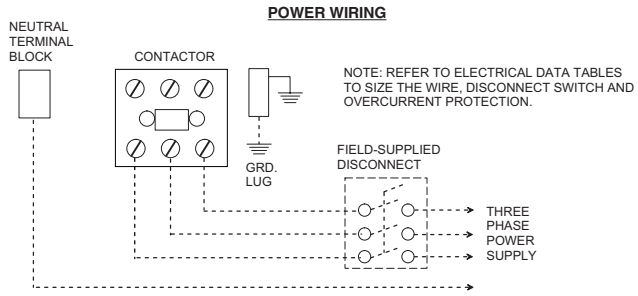

POWER WIRING
NEUTRAL TERMINAL BLOCK
CONTACTOR
NOTE: REFER TO ELECTRICAL DATA TABLES TO SIZE THE WIRE, DISCONNECT SWITCH AND OVERCURRENT PROTECTION.
GRD. LUG
FIELD-SUPPLIED DISCONNECT
THREE PHASE POWER SUPPLY

**FIG. 3** - TYPICAL FIELD WIRING

**TABLE 2** - GAS HEAT APPLICATION DATA

| Input Capacity, (kW) | Output Capacity, (kW) | Available on Models | Gas Rate[1] ($m^3$/s) | Temp. Rise °C At Full Input [2] | |
|---|---|---|---|---|---|
| | | | | Min. | Max. |
| 15 | 12 | 036 | 0.02 | 8 | 25 |
| 22 | 18 | 048 | 0.03 | 14 | 31 |
| 29 | 23 | 060, 076 | 0.04 | 14 | 31 |

| Input Capacity, (Mbh) | Output Capacity, (Mbh) | Available on Models | Gas Rate[1] ($Ft.^3$/Hr.) | Temp. Rise °F At Full Input [2] | |
|---|---|---|---|---|---|
| | | | | Min. | Max. |
| 50 | 40 | 036 | 0.02 / 47 | 15 | 45 |
| 75 | 60 | 048 | 0.03 / 70 | 25 | 55 |
| 100 | 79 | 060, 076 | 0.04 / 93 | 25 | 55 |

[1]Based on 1075 Btu/$Ft^3$.

[2]The air flow must be adjusted to obtain a temperature rise within the range shown.

### DISCONNECT SWITCH BRACKET FOR UNITS WITH OPTIONAL BELT-DRIVE BLOWER

A special bracket for mounting a field-supplied disconnect switch is provided in each unit ordered with an optional belt-drive supply air blower. The bracket is shipped inside the blower compartment taped to the top of the blower housing. Install the bracket on the left hand side of the unit as shown in Figure 9. Several existing screws at the top of the unit and one screw approximately midway down from the top will be used for mounting the bracket. Screws should be loosened only - NOT REMOVED. Matching holes in the bracket have elongated keyways allowing easy installation. Re-tighten screws after bracket is in place to ensure panels will remain leak tight.

DIMENSIONS IN MILLIMETERS

NOTE: Compounds used on threaded joints of gas piping shall be resistant to the action of liquefied petroleum gases.

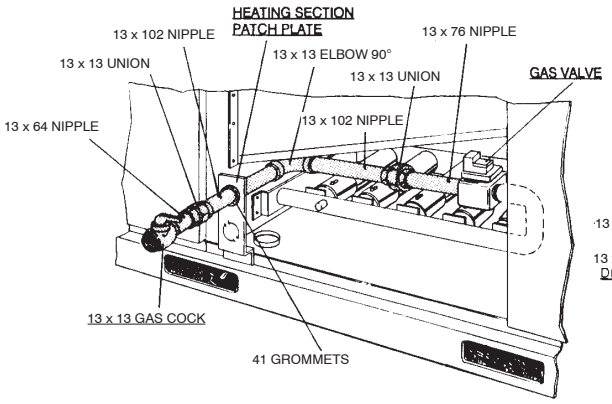



**FIG. 4** - EXTERNAL SUPPLY CONNECTION EXTERNAL SHUT-OFF

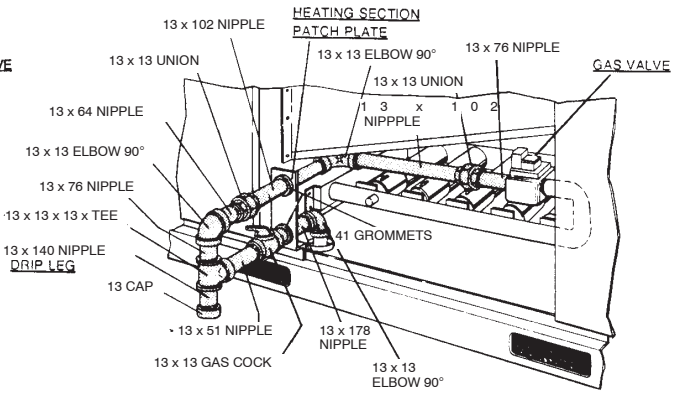



**FIG. 5** - BOTTOM SUPPLY CONNECTION EXTERNAL SHUT-OFF

## GAS PIPING

Proper sizing of gas piping depends on the volume rate of gas flow required, specific gravity of the gas and the length of run. Local codes or gas company requirements should be followed when determining pipe size. Refer to Table 3.

### TABLE 3 - PIPING SIZE

| Length (m/ft) | Nominal Iron Pipe Size | | | |
|---|---|---|---|---|
| | 12.7mm (½ in.) | 19mm (¾ in.) | 25mm (1 in.) | 32mm (1¼ in.) |
| 3 / 10 | 3.74 / 132 | 7.87 / 278 | 14.72 / 520 | 29.72 / 1,050 |
| 6 / 20 | 2.60 / 92 | 5.38 / 190 | 9.91 / 350 | 20.66 / 730 |
| 9 / 30 | 2.07 / 73 | 4.30 / 152 | 8.07 / 285 | 16.70 / 590 |
| 12 / 40 | 1.78 / 63 | 3.68 / 130 | 6.93 / 245 | 14.15 / 500 |
| 15 / 50 | 1.58 / 56 | 3.25 / 115 | 6.08 / 215 | 12.45 / 440 |
| 18 / 60 | 1.42 / 50 | 2.97 / 105 | 5.52 / 195 | 11.32 / 400 |
| 21 / 70 | 1.30 / 46 | 2.72 / 96 | 5.09 / 180 | 10.47 / 370 |
| 24 / 80 | 1.22 / 43 | 2.55 / 90 | 4.81 / 170 | 9.91 / 350 |
| 27 / 90 | 1.13 / 40 | 2.38 / 84 | 4.53 / 160 | 9.06 / 320 |
| 30 / 100 | 1.08 / 38 | 2.23 / 79 | 4.25 / 150 | 8.63 / 305 |

Maximum capacity of pipe in cubic meters/cubic feet of gas per hour. (Based upon a pressure drop of 0.3 inch water column and 0.6 specific gravity gas).

The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

*NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 12.7 mm (1/2 in.) pipe connection at the entrance fitting.*

## GAS CONNECTION

The gas supply line can be routed through the knockouts located on the front of the unit or through the opening provided in the unit's base. Refer to Figure 9 to locate these access openings. Typical supply piping arrangements are shown in Figures 4 and 5. All shaded items are field-supplied.

Two grommets are shipped in the blower compartment (in parts bag taped to the blower housing) of every unit with gas heat and should be used in the knockouts when the gas piping penetrates the front of the unit.

After the gas supply piping has been installed, the bottom opening should be sealed to prevent water from leaking into the building.

Gas piping recommendations:

1. A drip leg and a ground joint union must be installed in the gas piping.
2. When required by local codes, a manual shut-off valve may have to be installed outside of the unit.
3. Use wrought iron or steel pipe for all gas lines. Pipe compound should be applied sparingly to male threads only.

*WARNING: Natural gas may contain some propane. Propane, being an excellent solvent, will quickly dissolve white lead or most standard commercial compounds. Therefore, a special pipe compound must be applied when wrought iron or steel pipe is used. Shellac base compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Cyde's or John Crane may be used.*

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out the loose dirt and scale. Before initial start-up, be sure that all of the gas lines external to the unit have been purged of air.
5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under “Limitations”. After the gas connections have been completed, open the main shut-off valve admitting *normal gas pressure* to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. NEVER USE A FLAME.
6. The furnace and its individual manual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 3.48 kPa (0.5 psig).
7. A 4.7 mm (1/8 in.) NPT plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the furnace.

## VENT AND COMBUSTION AIR HOODS

The vent and combustion air hoods are shipped attached to the blower housing in the blower compartment. These hoods must be installed on the outside of the gas heat access panel to ensure proper unit function. The necessary mounting screws are provided in a bag also attached to the blower housing.

The screen for the combustion air intake hood is secured to the inside of the access panel opening with three fasteners and the screws used for mounting the hood to the panel. The top flange of this hood slips in under the top of the access panel opening when installing. Refer to Figure 6. Remove the protective label covering the opening just prior to installing this hood.

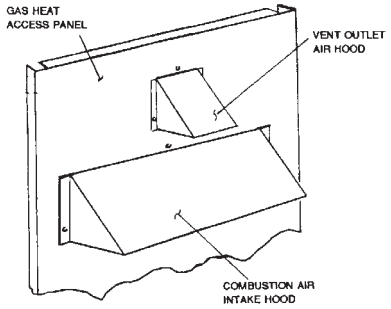



**FIG. 6** - VENT AND COMBUSTION AIR HOODS

The vent hood (including its screen) is installed by inserting the top flange of the hood into the slotted opening in the access panel. The top screw secures the hood to the access panel. The remaining two side screws must be installed after the access panel is installed on the unit. These screws engage the bottom flue box flange.

*CAUTION: All three screws in the vent hood must be properly installed before furnace operation to insure all combustion products are exhausted from the unit.*

## OPTIONAL ECONOMIZER RAIN HOOD

The following procedure should be used when assembling an economizer rain hood onto a unit. Refer to Figure 7. The outdoor and return air dampers, damper actuator, the linkage and all the controls are factory mounted as part of the economizer option.

All of the hood components, including the filters, the gasketing and the hardware for assembling are located above the top filter racks within the filter section. The outdoor air sensor is in the bag of parts located at the bottom of the return air section.

1. With filter section access panel removed, take out hood components, filters and sensor described above. Remove and discard outdoor air opening cover on back unit (Upper right hand corner).
2. Remove the 12.7 mm (1/2 in.) knockout (A) in the units rear panel (located to the right side of the outdoor air opening). Insert the two loose wires from inside the unit, into the 12.7 mm (1/2 in.) bushing provided. Insert wires and bushing into knockout. Snap bushing into place.
3. Mount the outdoor air sensor to the rear panel, just below the knockout described in Step 2. Secure with two self-drilling screws at dimples (B) provided in the panel.

*NOTE: Sensor must be positioned so that the sensing ports are at the top (louvers pointing downward) and terminal connections to the right.*

4. Connect the two wires, indicated in Step 2, to the sensor as follows:
   - Wire #73 to terminal (+)
   - Wire #74 to terminal (S)
5. Assemble the LH and RH side plates to the top cover (2 screws each side) to form the hood. Apply gasketing to the flange surface on each side plate. Extend gasketing 7 mm (1/4in.) beyond top and bottom of each flange to insure adequate corner sealing. Secure this assembly to the unit back panel (upper right hand corner). First, remove screw (C) on unit top cover. Then slip flange of hood cover in under flange of unit top cover, replace screw (C), engaging hole (E) in hood flange and tighten. Attach the two side plates to the unit panel by using two self-drilling screws for each side plate at dimples (D) provided in the panel.
6. Position fillpiece at bottom of hood, between the two side plates but do not secure at this time. (Slotted openings MUST be downward for drainage). After fillpiece is properly positioned, note where contact is made with the unit panel. Remove fillpiece and apply gasket material to this area to provide a seal. Reposition fillpiece and secure with 2 screws.
7. Install the two filters into the hood assembly, sliding down along retainers on side plates, into fillpiece at bottom of hood.

*NOTE: Install filters so that "Air Flow" arrows point toward the unit.*

8. Install filter cover over the end of the hood with one screw (center of hood), securing filters into position.

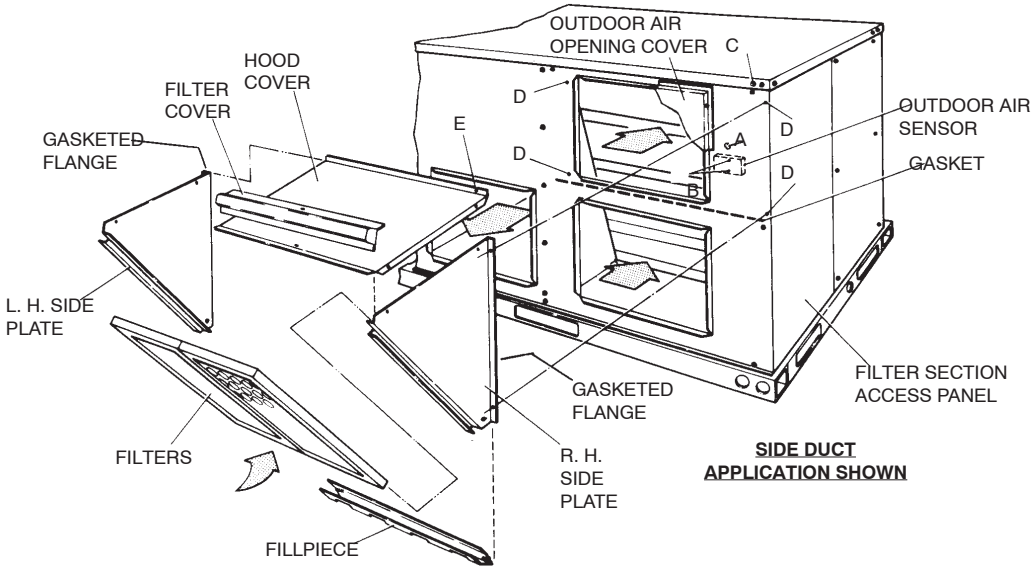



**FIG. 7** - ECONOMIZER RAIN HOOD ASSEMBLY (OPTION)

*CAUTION: When proceeding with Steps 9 and 10, extreme care must be exercised while turning both the set point and minimum position adjusting screws to prevent twisting them off.*

9. The enthalpy set point for the dampers may now be set by selecting the desired set point from graph in Figure 8. For a single enthalpy economizer, carefully turn the set point adjusting screw to the “A”, “B”, “C” or “D” setting corresponding to the lettered curve. For a dual enthalpy economizer, carefully turn the set point adjusting screw fully clockwise past the “D” setting.

10. To check that the damper blades move smoothly without binding, carefully turn the minimum position adjusting screw fully clockwise and then energize and de-energize terminals “R” to “G”. With terminals “R” to “G” energized, turn the minimum position screw counterclockwise until the desired minimum position has been attained.

11. Replace the filter section access panel.

| CONTROL CURVE | CONTROL POINT (APPROX. DEG.) AT 50% RH |
|---|---|
| A | 73 [23] |
| B | 70 [21] |
| C | 67 [19] |
| D | 63 [17] |

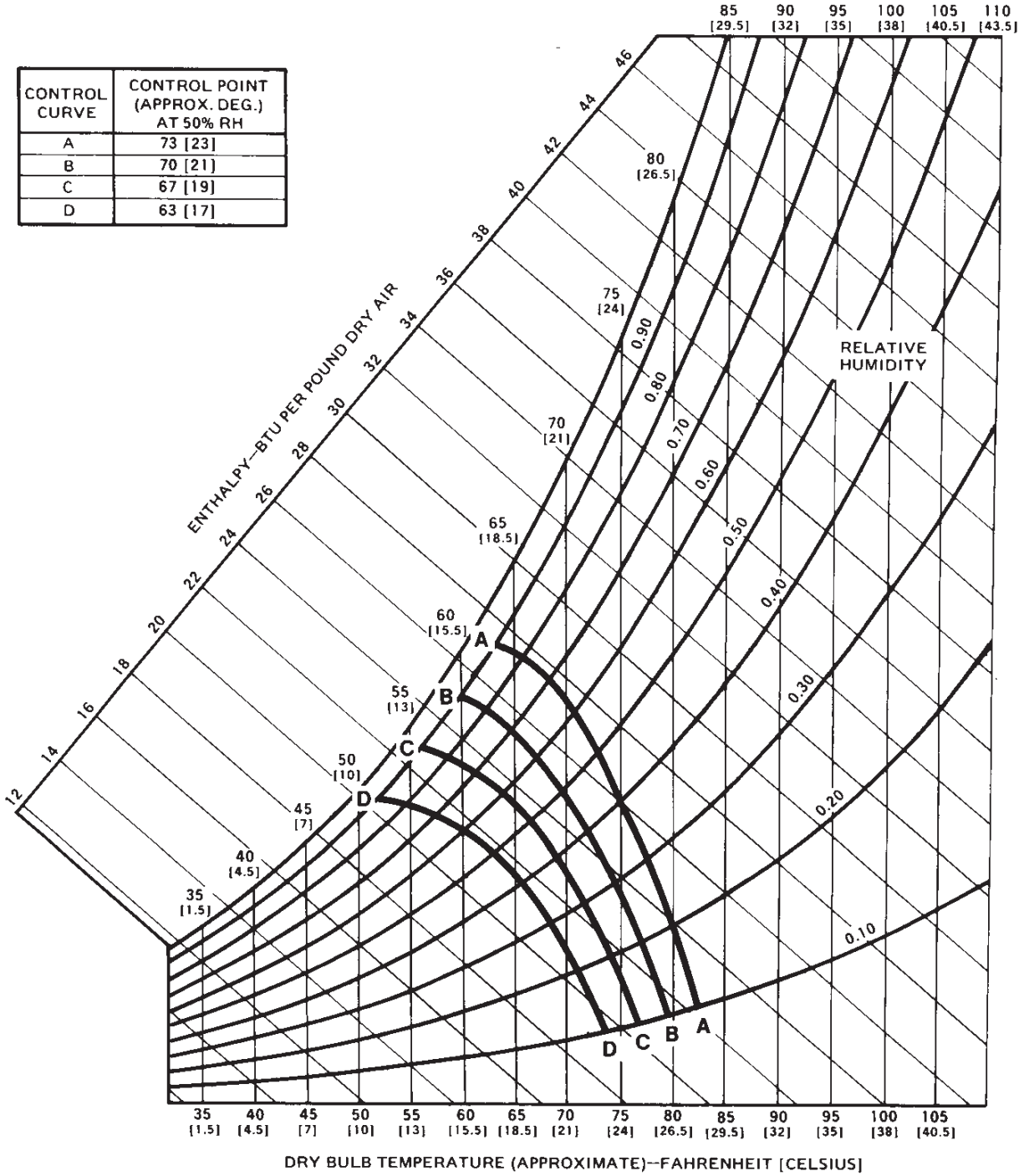



**FIG. 8** - ENTHALPY SET POINT ADJUSTMENT

## **TABLE 4** - PHYSICAL DATA

| MODELS | | UNIT SIZE | | | |
|---|---|---|---|---|---|
| | | 036 | 048 | 060 | 076 |
| EVAP. BLOWER | CENTRIFUGAL BLOWER (Dia. x Wd. mm (in.) | 305 x 254 (12 x 10) | 305 x 254 (12 x 10) | 305 x 254 (12 x 10) | 305 x 279 (12 x 11) |
| | FAN MOTOR HP (Direct-Drive) | ½ | ¾ | N/A | N/A |
| | FAN MOTOR HP (Belt-Drive) | N/A | N/A | 1.5 | 1.5 |
| EVAP. COIL | ROWS DEEP | 3 | 3 | 3 | 3 |
| | FINS PER 25mm (1 in.) | 13 | 13 | 13 | 13 |
| | FACE AREA ($m^2$/$ft^2$/) | 0.33 / 3.6 | 0.40 / 4.3 | 0.57 / 5.1 | 0.57 / 5.1 |
| COND. FAN | PROPELLER DIA. (mm/in.) | 610 / 24 | 610 / 24 | 610 / 24 | 610 / 24 |
| | FAN MOTOR HP | ½ | ½ | ½ | ½ |
| | NOM. CFM TOTAL | 4,500 | 4,500 | 4,500 | 4,500 |
| COND. COIL | ROWS DEEP | 1 | 1 | 1 | 2 |
| | FINS PER 25mm (1 in.) | 16 | 19 | 22 | 16 |
| | FACE AREA ($m^2$/$ft^2$/) | 1.60 / 17.1 | 1.60 / 17.1 | 1.60 / 17.1 | 1.55 / 16.7 |
| AIR FILTERS (SEE NOTE) | QUANTITY PER UNIT (356mm x 508mm x 25mm) | 2 | 2 | 2 | 2 |
| | QUANTITY PER UNIT (356mm X 635mm X 25mm) | 1 | 1 | 1 | 1 |
| | TOTAL FACE AREA ($m^2$/ $ft^2$) | 0.59 / 6.3 | 0.59 / 6.3 | 0.59 / 6.3 | 0.59 / 6.3 |
| CHARGE | REFRIGERANT 22 (kg / lbs./oz.) | 2.72 / 6/0 | 3 / 6/10 | 2.8 / 6/12 | 4.5 / 10 |

NOTE: Filter racks are adapted for 25.4 mm (1 in.) or 50.8 mm (2 in.) thick filters.

| WEIGHTS (kg/lbs) | | | | | |
|---|---|---|---|---|---|
| Basic Unit (Nom. Max.) | 3 Ton | 277 / 610 | OPTIONS / ACCESSORIES | Economizer | 23 / 50 |
| | 4 Ton | 295 / 650 | | Motorized Outdoor Air Damper | 22 / 48 |
| | 5 Ton | 314 / 690 | | Barometric Relief/Fixed Outdoor Air Intake Damper | 4.5 / 10 |
| | 6 Ton | 339 / 745 | | Roof Mounting Curb | 42 / 92 |

## **TABLE 5** - ELECTRICAL DATA (BASIC UNIT)

| UNIT SIZE | POWER SUPPLY | VOLTAGE LIMITATIONS[1] | | COMPRESSOR | | COND. FAN MOTOR FLA | SUPPLY AIR BLOWER MOTOR FLA | TOTAL UNIT AMPACITY AMPS | MAX. FUSE SIZE AMPS[2] | MAX. HACR BREAKER SIZE AMPS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MIN. | MAX. | FLA | LRA | | | | | |
| 036 | 380/415-3-50 | 342 | 457 | 5.8 | 64 | 1.8 | 2.0 | 11.3 | 15 | 15 |
| 048 | 380/415-3-50 | 342 | 457 | 9.6 | 73 | 1.8 | 4.0 | 18.0 | 25 | 25 |
| 060 | 380/415-3-50 | 342 | 457 | 9.6 | 74 | 1.8 | 2.6 | 16.6 | 25 | 25 |
| 076 | 380/415-3-50 | 342 | 457 | 14.1 | 128 | 1.8 | 2.6 | 22.0 | 35 | 35 |

[1] Utilization Range "A" in accordance with ari Standard 110. [2] Dual element, time delay type. [3] Based on 80°C copper conductors.

## **TABLE 6** - MOTOR AND DRIVE DATA - Belt-Drive Blower

| UNIT SIZE | BLOWER RANGE (RPM) | MOTOR* | | | | ADJUSTABLE MOTOR PULLEY | | | | FIXED BLOWER PULLEY | | | | BELT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HP | RPM | FRAME SIZE | SERVICE FACTOR | PITCH DIA. | | BORE | | PITCH DIA. | | BORE | | PITCH LENGTH | | DESIGNATION |
| | | | | | | mm | in. | mm | in. | mm | in. | mm | in. | mm | in. | |
| 060 | 850 - 1180 | 1½ | 1450 | 56 | 1.15 | 69-97 | 2.8 -3.8 | 22 | ⅞ | 127 | 5.0 | 25 | 1 | 947 | 37.3 | A36 |
| 076 | 900 - 1200 | 1½ | 1450 | 56 | 1.15 | 86 - 112 | 3.4 - 4.4 | 22 | ⅞ | 132 | 5.2 | 25 | 1 | 973 | 38.3 | A37 |

*All motors have solid bases and are inherently protected. These motors can be selected to operate into their service factor because they are located in the moving air, upstream of any heating device.

## **TABLE 7** - STATIC RESISTANCES

EXTERNAL STATIC PRESSURE DROP

| DESCRIPTION | RESISTANCE, Pa | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $M^3$/s | | | | | | | | | | |
| | 0.47 | 0.57 | 0.66 | 0.75 | 0.85 | 0.94 | 1.03 | 1.13 | 1.23 | 1.32 | 1.42 |
| Economizer/Motorized Damper[1, 2] | 17.4 | 19.8 | 22.3 | 27.3 | 32.2 | 37.2 | 42.2 | 50.0 | 57.0 | 64.5 | 74.4 |
| Bottom Duct Connections[1] | 14.9 | 17.4 | 19.8 | 22.3 | 24.8 | 27.3 | 29.8 | 35.7 | 39.7 | 47.1 | 54.6 |

| DESCRIPTION | RESISTANCE, IWG | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CFM | | | | | | | | | | |
| | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 | 2800 | 3000 |
| Economizer/Motorized Damper[1, 2] | 0.07 | 0.08 | 0.09 | 0.11 | 0.13 | 0.15 | 0.17 | 0.20 | 0.23 | 0.26 | 0.30 |
| Bottom Duct Connections[1] | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.11 | 0.12 | 0.14 | 0.16 | 0.19 | 0.22 |

[1]Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.
[2]The pressure thru the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

**TABLE 8** - SUPPLY AIR PERFORMANCE 3 and 4 Ton w/Direct-Drive Blower
@ 380/415 Volts - Side Duct Connections

$M^3/S$

| UNIT SIZE | MOTOR SPEED | Available External Static Pressure - Pa * | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 | | 74 | | 99 | | 124 | | 149 | |
| | | $m^3/s$ | Watts | $m^3/s$ | Watts | $m^3/s$ | Watts | $m^3/s$ | Watts | $m^3/s$ | Watts |
| 036 | HI | - | - | - | - | 0.80 | 825 | 0.78 | 785 | 0.74 | 755 |
| | MED | 0.79 | 800 | 0.77 | 780 | 0.75 | 750 | 0.72 | 720 | 0.67 | 690 |
| | LOW | 0.70 | 710 | 0.69 | 690 | 0.67 | 670 | 0.64 | 650 | 0.62 | 620 |
| 048 | HI | 0.94 | 960 | 0.91 | 936 | 0.88 | 910 | 0.85 | 880 | 0.81 | 845 |
| | MED | 0.85 | 838 | 0.83 | 810 | 0.80 | 785 | 0.78 | 765 | 0.75 | 735 |
| | LOW | 0.79 | 760 | 0.77 | 738 | 0.76 | 715 | 0.73 | 695 | 0.70 | 670 |

| UNIT SIZE | MOTOR SPEED | Available External Static Pressure - Pa * | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 174 | | 198 | | 223 | | 248 | |
| | | $m^3/s$ | Watts | $m^3/s$ | Watts | $m^3/s$ | Watts | $m^3/s$ | Watts |
| 036 | HI | 0.67 | 725 | 0.64 | 700 | 0.60 | 680 | 0.56 | 655 |
| | MED | 0.62 | 650 | 0.59 | 630 | 0.59 | 610 | 0.52 | 590 |
| | LOW | 0.59 | 605 | 0.56 | 590 | 0.55 | 570 | 0.48 | 545 |
| 048 | HI | 0.77 | 820 | 0.73 | 790 | 0.67 | 765 | 0.61 | 740 |
| | MED | 0.71 | 705 | 0.66 | 675 | 0.61 | 645 | 0.56 | 625 |
| | LOW | 0.67 | 645 | 0.63 | 620 | 0.58 | 595 | 0.53 | 575 |

CFM

| UNIT SIZE | MOTOR SPEED | Available External Static Pressure - IWG * | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.20 | | 0.30 | | 0.40 | | 0.50 | | 0.60 | |
| | | CFM | Watts | CFM | Watts | CFM | Watts | CFM | Watts | CFM | Watts |
| 036 | HI | - | - | - | - | 1699 | 825 | 1650 | 785 | 1570 | 755 |
| | MED | 1684 | 800 | 1631 | 780 | 1582 | 750 | 1524 | 720 | 1410 | 690 |
| | LOW | 1487 | 710 | 1464 | 690 | 1421 | 670 | 1367 | 650 | 1315 | 620 |
| 048 | HI | 1996 | 960 | 1933 | 936 | 1868 | 910 | 1795 | 880 | 1722 | 845 |
| | MED | 1804 | 838 | 1765 | 810 | 1714 | 785 | 1650 | 765 | 1589 | 735 |
| | LOW | 1681 | 760 | 1640 | 738 | 1604 | 715 | 1541 | 695 | 1490 | 670 |

| UNIT SIZE | MOTOR SPEED | Available External Static Pressure - IWG * | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.70 | | 0.80 | | 0.90 | | 1.00 | |
| | | CFM | Watts | CFM | Watts | CFM | Watts | CFM | Watts |
| 036 | HI | 1430 | 725 | 1360 | 700 | 1280 | 680 | 1180 | 655 |
| | MED | 1324 | 650 | 1260 | 630 | 1185 | 610 | 1100 | 590 |
| | LOW | 1246 | 605 | 1185 | 590 | 1110 | 570 | 1020 | 545 |
| 048 | HI | 1635 | 820 | 1544 | 790 | 1419 | 765 | 1300 | 740 |
| | MED | 1508 | 705 | 1407 | 675 | 1306 | 645 | 1195 | 625 |
| | LOW | 1416 | 645 | 1337 | 620 | 1230 | 595 | 1120 | 575 |

* INCLUDES ALLOWANCES FOR WET EVAPORATOR COIL, 25MM (1 IN.) FILTERS AND GAS-FIRED HEAT EXCHANGERS. REFER TO TABLE 7 FOR RESISTANCE VALUES ON CONNECTIONS OTHER THAN SIDE DUCT AIRFLOWS.

**TABLE 9** - SUPPLY AIR PERFORMANCE - $M^3/S$ - 5 & 6 Ton w/Belt-Drive Blower

5 TON - SIDE DUCT CONNECTIONS @ 380/415 Volts

| UNIT SIZE | AIR FLOW $M^3/S$ | Available External Static Pressure - Pa* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 | | 74 | | 99 | | 124 | | 149 | | 174 | | 198 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 060 | 1.18 | 1059 | 1560 | 1077 | 1590 | 1095 | 1630 | 1114 | 1650 | 1134 | 1660 | 1158 | 1685 | - | - |
| | 1.13 | 1032 | 1405 | 1054 | 1470 | 1074 | 1525 | 1094 | 1560 | 1116 | 1595 | 1140 | 1620 | 1167 | 1640 |
| | 1.08 | 1005 | 1260 | 1024 | 1275 | 1049 | 1370 | 1069 | 1440 | 1090 | 1475 | 1116 | 1505 | 1142 | 1535 |
| | 1.04 | 980 | 1160 | 1002 | 1170 | 1022 | 1190 | 1044 | 1250 | 1066 | 1350 | 1090 | 1410 | 1117 | 1440 |
| | 0.99 | 930 | 1060 | 957 | 1070 | 983 | 1080 | 1010 | 1100 | 1039 | 1160 | 1064 | 1260 | 1092 | 1340 |
| | 0.94 | 877 | 950 | 908 | 975 | 941 | 1000 | 976 | 1020 | 1009 | 1050 | 1040 | 1100 | 1070 | 1225 |
| | 0.90 | - | - | - | - | 894 | 885 | 940 | 940 | 980 | 980 | 1014 | 1020 | 1047 | 1095 |
| | 0.85 | - | - | - | - | 855 | 815 | 903 | 860 | 950 | 905 | 988 | 940 | 1022 | 970 |
| | 0.80 | - | - | - | - | - | - | 884 | 815 | 925 | 850 | 964 | 880 | 1001 | 910 |
| | 0.75 | - | - | - | - | - | - | 864 | 770 | 908 | 805 | 948 | 835 | 987 | 870 |
| | 0.71 | - | - | - | - | - | - | - | - | 882 | 740 | 926 | 780 | 965 | 830 |

| UNIT SIZE | AIR FLOW $M^3/S$ | Available External Static Pressure - Pa* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 223 | | 248 | | 273 | | 298 | | 322 | | 347 | | 372 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 060 | 1.18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.08 | 1170 | 1580 | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.04 | 1148 | 1480 | 1180 | 1530 | - | - | - | - | - | - | - | - | - | - |
| | 0.99 | 1121 | 1385 | 1155 | 1425 | - | - | - | - | - | - | - | - | - | - |
| | 0.94 | 1100 | 1285 | 1133 | 1340 | 1169 | 1385 | - | - | - | - | - | - | - | - |
| | 0.90 | 1079 | 1180 | 1110 | 1240 | 1143 | 1280 | 1178 | 1330 | - | - | - | - | - | - |
| | 0.85 | 1058 | 1060 | 1090 | 1135 | 1122 | 1190 | 1158 | 1240 | - | - | - | - | - | - |
| | 0.80 | 1035 | 960 | 1071 | 1030 | 1103 | 1100 | 1134 | 1140 | 1164 | 1175 | - | - | - | - |
| | 0.75 | 1020 | 900 | 1056 | 965 | 1088 | 1035 | 1118 | 1065 | 1145 | 1105 | 1170 | 1130 | - | - |
| | 0.71 | 1004 | 860 | 1038 | 880 | 1070 | 925 | 1101 | 980 | 1130 | 1045 | 1158 | 1075 | - | - |

*INCLUDES ALLOWANCES FOR A WET EVAPORATOR COIL, 25mm (1 in.) FILTERS, AND GAS-FIRED HEAT EXCHANGERS. REFER TO TABLE 7 FOR RESISTANCE VALUES ON CONNECTIONS OTHER THAN SIDE DUCT AIRFLOWS.

6 TON - SIDE DUCT CONNECTIONS @ 380/415 Volts

| UNIT SIZE | AIR FLOW $M^3/S$ | Available External Static Pressure - Pa* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 50 | | 74 | | 99 | | 124 | | 149 | | 174 | | 198 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 076 | 1.50 | 1150 | 2325 | 1182 | 2425 | - | - | - | - | - | - | - | - | - | - |
| | 1.42 | 1100 | 2010 | 1129 | 2090 | 1157 | 2150 | 1185 | 2225 | - | - | - | - | - | - |
| | 132 | 1045 | 1700 | 1074 | 1780 | 1102 | 1850 | 1131 | 1940 | 1160 | 2025 | 1190 | 2075 | - | - |
| | 1.23 | 985 | 1425 | 1015 | 1475 | 1045 | 1540 | 1075 | 1630 | 1103 | 1715 | 1135 | 1760 | 1163 | 1825 |
| | 1.13 | 930 | 1240 | 958 | 1300 | 990 | 1350 | 1020 | 1400 | 1051 | 1430 | 1081 | 1490 | 1111 | 1600 |
| | 1.04 | - | - | 905 | 1070 | 933 | 1160 | 965 | 1210 | 997 | 1250 | 1028 | 1285 | 1060 | 1325 |
| | 0.94 | - | - | - | - | - | - | 919 | 1025 | 950 | 1100 | 982 | 1130 | 1014 | 1160 |
| | 0.85 | - | - | - | - | - | - | - | - | 909 | 925 | 939 | 1005 | 968 | 1030 |

| UNIT SIZE | AIR FLOW $M^3/S$ | Available External Static Pressure - Pa* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 223 | | 248 | | 273 | | 298 | | 322 | | 347 | | 372 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 076 | 1.50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.42 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.32 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.23 | 1193 | 1920 | - | - | - | - | - | - | - | - | - | - | - | - |
| | 1.13 | 1142 | 1675 | 1173 | 1730 | - | - | - | - | - | - | - | - | - | - |
| | 1.04 | 1090 | 1380 | 1124 | 1450 | 1155 | 1550 | 1186 | 1640 | - | - | - | - | - | - |
| | 0.94 | 1045 | 1175 | 1077 | 1200 | 1109 | 1275 | 1140 | 1360 | 1170 | 1460 | - | - | - | - |
| | 0.85 | 998 | 1050 | 1028 | 1060 | 1058 | 1060 | 1087 | 1075 | 1118 | 1150 | 1148 | 1250 | 1176 | 1360 |

*INCLUDES ALLOWANCES FOR A WET EVAPORATOR COIL, 25mm (1 in.)FILTERS, AND GAS-FIRED HEAT EXCHANGERS. REFER TO TABLE 7 FOR RESISTANCE VALUES ON CONNECTIONS OTHER THAN SIDE DUCT AIRFLOWS.

Continued on next page

TABLE 9 (continued) - SUPPLY AIR PERFORMANCE - CFM - 5 & 6 Ton w/Belt-Drive Blower

## 5 TON - SIDE DUCT CONNECTIONS @ 380/415 Volts

| UNIT SIZE | AIR FLOW CFM | Available External Static Pressure - IWG* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.20 | | 0.30 | | 0.40 | | 0.50 | | 0.60 | | 0.70 | | 0.80 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 060 | 2500 | 1059 | 1560 | 1077 | 1590 | 1095 | 1630 | 1114 | 1650 | 1134 | 1660 | 1158 | 1685 | - | - |
| | 2400 | 1032 | 1405 | 1054 | 1470 | 1074 | 1525 | 1094 | 1560 | 1116 | 1595 | 1140 | 1620 | 1167 | 1640 |
| | 2300 | 1005 | 1260 | 1024 | 1275 | 1049 | 1370 | 1069 | 1440 | 1090 | 1475 | 1116 | 1505 | 1142 | 1535 |
| | 2200 | 980 | 1160 | 1002 | 1170 | 1022 | 1190 | 1044 | 1250 | 1066 | 1350 | 1090 | 1410 | 1117 | 1440 |
| | 2100 | 930 | 1060 | 957 | 1070 | 983 | 1080 | 1010 | 1100 | 1039 | 1160 | 1064 | 1260 | 1092 | 1340 |
| | 2000 | 877 | 950 | 908 | 975 | 941 | 1000 | 976 | 1020 | 1009 | 1050 | 1040 | 1100 | 1070 | 1225 |
| | 1900 | - | - | - | - | 894 | 885 | 940 | 940 | 980 | 980 | 1014 | 1020 | 1047 | 1095 |
| | 1800 | - | - | - | - | 855 | 815 | 903 | 860 | 950 | 905 | 988 | 940 | 1022 | 970 |
| | 1700 | - | - | - | - | - | - | 884 | 815 | 925 | 850 | 964 | 880 | 1001 | 910 |
| | 1600 | - | - | - | - | - | - | 864 | 770 | 908 | 805 | 948 | 835 | 987 | 870 |
| | 1500 | - | - | - | - | - | - | - | - | 882 | 740 | 926 | 780 | 965 | 830 |

| UNIT SIZE | AIR FLOW CFM | Available External Static Pressure - IWG* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.90 | | 1.00 | | 1.10 | | 1.20 | | 1.30 | | 1.40 | | 1.50 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 060 | 2500 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2300 | 1170 | 1580 | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2200 | 1148 | 1480 | 1180 | 1530 | - | - | - | - | - | - | - | - | - | - |
| | 2100 | 1121 | 1385 | 1155 | 1425 | - | - | - | - | - | - | - | - | - | - |
| | 2000 | 1100 | 1285 | 1133 | 1340 | 1169 | 1385 | - | - | - | - | - | - | - | - |
| | 1900 | 1079 | 1180 | 1110 | 1240 | 1143 | 1280 | 1178 | 1330 | - | - | - | - | - | - |
| | 1800 | 1058 | 1060 | 1090 | 1135 | 1122 | 1190 | 1158 | 1240 | - | - | - | - | - | - |
| | 1700 | 1035 | 960 | 1071 | 1030 | 1103 | 1100 | 1134 | 1140 | 1164 | 1175 | - | - | - | - |
| | 1600 | 1020 | 900 | 1056 | 965 | 1088 | 1035 | 1118 | 1065 | 1145 | 1105 | 1170 | 1130 | - | - |
| | 1500 | 1004 | 860 | 1038 | 880 | 1070 | 925 | 1101 | 980 | 1130 | 1045 | 1158 | 1075 | - | - |

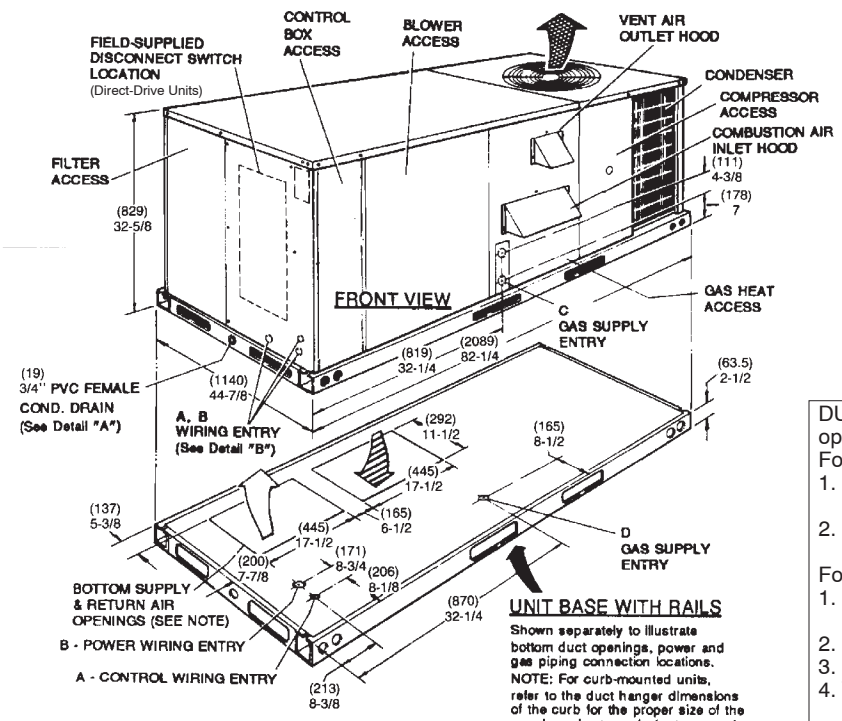
*INCLUDES ALLOWANCES FOR A WET EVAPORATOR COIL, 25mm (1 IN.) FILTERS, AND GAS-FIRED HEAT EXCHANGERS. REFER TO TABLE 7 FOR RESISTANCE VALUES ON CONNECTIONS OTHER THAN SIDE DUCT AIRFLOWS.

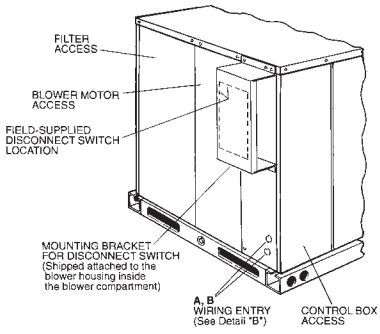
## 6 TON - SIDE DUCT CONNECTIONS @ 380/415 Volts

| UNIT SIZE | AIR FLOW CFM | Available External Static Pressure - IWG* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.20 | | 0.30 | | 0.40 | | 0.50 | | 0.60 | | 0.70 | | 0.80 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 076 | 3200 | 1150 | 2325 | 1182 | 2425 | - | - | - | - | - | - | - | - | - | - |
| | 3000 | 1100 | 2010 | 1129 | 2090 | 1157 | 2150 | 1185 | 2225 | - | - | - | - | - | - |
| | 2800 | 1045 | 1700 | 1074 | 1780 | 1102 | 1850 | 1131 | 1940 | 1160 | 2025 | 1190 | 2075 | - | - |
| | 2600 | 985 | 1425 | 1015 | 1475 | 1045 | 1540 | 1075 | 1630 | 1103 | 1715 | 1135 | 1760 | 1163 | 1825 |
| | 2400 | 930 | 1240 | 958 | 1300 | 990 | 1350 | 1020 | 1400 | 1051 | 1430 | 1081 | 1490 | 1111 | 1600 |
| | 2200 | - | - | 905 | 1070 | 933 | 1160 | 965 | 1210 | 997 | 1250 | 1028 | 1285 | 1060 | 1325 |
| | 2000 | - | - | - | - | - | - | 919 | 1025 | 950 | 1100 | 982 | 1130 | 1014 | 1160 |
| | 1800 | - | - | - | - | - | - | - | - | 909 | 925 | 939 | 1005 | 968 | 1030 |

| UNIT SIZE | AIR FLOW CFM | Available External Static Pressure - IWG* | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.90 | | 1.00 | | 1.10 | | 1.20 | | 1.30 | | 1.40 | | 1.50 | |
| | | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts | RPM | Watts |
| 076 | 3200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 3000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2800 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2600 | 1193 | 1920 | - | - | - | - | - | - | - | - | - | - | - | - |
| | 2400 | 1142 | 1675 | 1173 | 1730 | - | - | - | - | - | - | - | - | - | - |
| | 2200 | 1090 | 1380 | 1124 | 1450 | 1155 | 1550 | 1186 | 1640 | - | - | - | - | - | - |
| | 2000 | 1045 | 1175 | 1077 | 1200 | 1109 | 1275 | 1140 | 1360 | 1170 | 1460 | - | - | - | - |
| | 1800 | 998 | 1050 | 1028 | 1060 | 1058 | 1060 | 1087 | 1075 | 1118 | 1150 | 1148 | 1250 | 1176 | 1360 |

*INCLUDES ALLOWANCES FOR A WET EVAPORATOR COIL, 25mm (1 in.) FILTERS, AND GAS-FIRED HEAT EXCHANGERS. REFER TO TABLE 7 FOR RESISTANCE VALUES ON CONNECTIONS OTHER THAN SIDE DUCT AIRFLOWS.





FILTER ACCESS
BLOWER MOTOR ACCESS
FIELD-SUPPLIED DISCONNECT SWITCH LOCATION
MOUNTING BRACKET FOR DISCONNECT SWITCH (Shipped attached to the blower housing inside the blower compartment)
A, B WIRING ENTRY (See Detail "B")
CONTROL BOX ACCESS

DISCONNECT SWITCH LOCATION AND MOTOR ACCESS PANEL FOR UNIT WITH "BELT-DRIVE" OPTION

DUCT COVERS - Units are shipped with all air duct openings covered.

For side duct applications;

1. Remove and discard the supply and return air duct covers.
2. Connect ductwork to duct flanges on the rear of the unit.

For bottom duct applications;

1. Remove the side supply air duct cover to gain access to the bottom supply air knockout panel.
2. Remove and discard the bottom knockout panel.
3. Replace the side duct cover.
4. With filter section access panel removed from the unit, remove and discard the bottom return air knockout panel.
5. Replace the filter access panel.

## CLEARANCES (mm/in.)

| | |
|---|---|
| Front | 813 / 32 |
| Back | 305 / 12 (Less Economizer)<br>914 / 36 (With Economizer) |
| Left Side (Filter Access) | 610 / 24 (Less Economizer)<br>914 / 36 (With Economizer) |
| Right Side (Cond. Coil) | 610 / 24 |
| Below Unit[1] | 0 / 0 |
| Above Unit[2] | 1829 / 72 (For Condenser Air Discharge) |

[1] Units may be installed on combustible floors made from wood or class A, B or C roof covering material (Applicable in the USA only).

[2] Units must be installed oudoors. Overhanging structures or shrubs should not obstruct the outdoor coil nor the fan outlet.

NOTE: A 25mm (1") clearance must be provided between any combustible material and the supply air ductwork for a distance of 1 meter (3 ft) from the unit. The products of combustion must not be allowed to accumulate within a confined space and recirculate.

Locate unit so that the vent air outlet hood is at least:

- One meter (3 ft) above any forced air inlet located within 3 horizontal meters (10 ft) (excluding those integral to the unit).
- 1.2 meters (4ft) below, 1.2 horizontal meters (4ft) from, or 0.3 meter (1ft) above any door or gravity air inlet into the building.
- 1.2 meters (4 ft) from electric meters, gas meters, regulators and relief equipment.

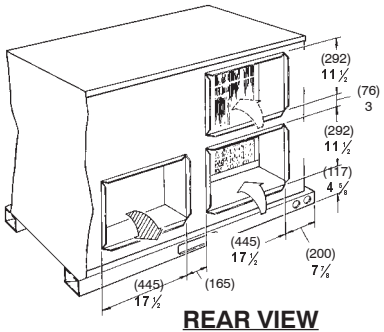
All dimensions are in millimeters and inches. They are subject to change without notice. Certified dimensions will be provided upon request.

## UTILITIES ENTRY DATA

| HOLE | KNOCKOUT SIZE (DIA.) (mm/in.) | USED FOR |
|---|---|---|
| A | 22 / 7/8* | Control Wiring (Side or Bottom)** |
| B | 51 / 2* | Power Wiring (Side or Bottom) |
| C | 41 / 1 5/8 | Gas Piping (Front) |
| D | 38 / 1 1/2 | Gas Piping (Bottom) |

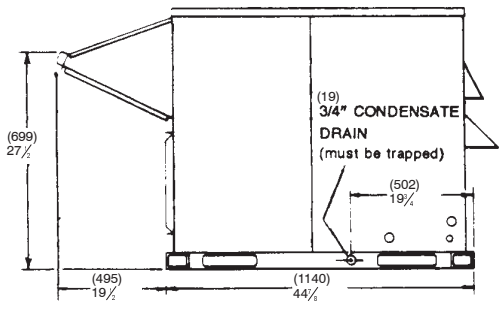
*nockouts in the bottom of the unit can be located by the slice in the insulation.

**Do not remove the 51mm (2") knockout ring.

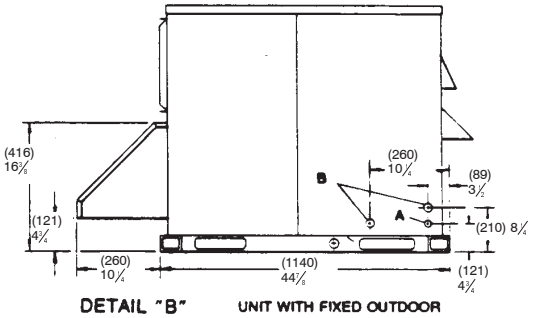



REAR VIEW

SIDE SUPPLY AND RETURN AIR OPENINGS




DETAIL "A" UNIT WITH ECONOMIZER RAIN HOOD




DETAIL "B" UNIT WITH FIXED OUTDOOR AIR / BAROMETRIC RELIEF RAIN HOOD

### AIR FLOW LEGEND

- RETURN AIR
- SUPPLY AIR
- OUTDOOR AIR
- OUTDOOR AIR (Economizer)

**FIG. 9 -** DIMENSIONS AND CLEARANCE (3, 4, 5 & 6 TON)

# OPERATION

## COOLING SYSTEM

The cooling section is a complete factory package utilizing an air-cooled condenser. The system is factory-charged with Refrigerant-22.

The compressor is hermetically sealed and internally sprung. The compressors have inherent (internal) protection. If there is an abnormal temperature rise in the scroll compressor, the protector will open to shut down the scroll compressor.

## PRELIMINARY OPERATION COOLING

After the installation has been completed, energize the crankcase heater for at least four hours before operating the unit. After this initial warm-up, the compressor should be given three false starts (energized just long enough to make a few revolutions) with a five minute delay between each start before being put into full time service.

*NOTE: Prior to each cooling season, the crankcase heater must be energized at least 10 hours before the system is put into operation.*

## COOLING SEQUENCE OF OPERATION

Single-Stage Cooling: When the thermostat calls for “cooling”, “R” is closed to “G” and “Y1" (wiring schematic) which completes the low voltage control circuit, immediately energizing the compressor, condenser fan motor and blower motor simultaneously.

Two-Stage Cooling: A two-stage cooling thermostat may be used if the unit has an economizer. First-stage cooling is provided by the economizer - if the outdoor air enthalpy is acceptable, and second-stage cooling is provided by the scroll compressor. Jumper wire J1 must be removed. Refer to the unit wiring diagram.

After the thermostat is satisfied and opens, all components will stop simultaneously.

CONTINUOUS BLOWER - Continuous blower operation is possible by closing the R to G circuit on the thermostat.

## SAFETY CONTROLS (Cooling)

The refrigerant system is equipped with the following safety controls:

1. A Suction Line Freezestat to protect aginst low evaporator temperatures due to a low air flow or a low return air temperature.
2. A High Pressure Cutout Switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure.
3. A Low Pressure Switch to protect against loss of refrigerant charge.

If either one of the above safety controls opens, the refrigerant system will bo locked out. The lock out of the system can be reset by opening the 24V circuit either at the room thermostat or at the unit disconnect.

## HEATING SEQUENCE OF OPERATION

The following sequence describes the operation of the gas heat section.

CONTINUOUS BLOWER: With the room thermostat switch set to “ON”, the supply air blower will operate continuously. The normally closed blower interlock relay contact “K3-1" provides 24 volt power to the blower relay ”BR". The “BR” power contacts close and the blower motor operates.

INTERMITTENT BLOWER: With the room thermostat system switch set to the “AUTO” or “HEAT” position and the fan switch set to “AUTO”, the supply air blower will operate after the room thermostat calls for heat and the air in the gas heat compartment has achieved a pre-set temeprature.

When “TH1" on the thermostat closes, the draft motor relay ”DMR" or “DMC” is energized. The “DMR” or “DMC” power contacts close which energizes the line voltage draft motor. As the speed of the draft motor reaches approximately 2500 RPM, the centrifugal switch contact “CS” located on the end of the draft motor shaft closes to power the ignition control “IC”.

After 15 seconds, the “IC” will start the ignitor sparking and will open the redundant valve locted inside the main gas valve “GV” to allow a flow of gas to only the carryover tube. See Figure 10. Only after the pilot flame has been ignited and the presence of pilot flame detected at the “IC” by a signal sent back through the flame sensor is sparking terminated and the main gas valve opened.

Gas flows into each of the main burners and is ignited from the carryover tube flame.

The “IC” will try for 85 seconds to ignite the pilot carryover tube. If the “IC” fails to detect a pilot flame during the 85 seconds, it will close the redundant valve. After a 5 minute purge period, the “IC” will again try to light the pilot carryover tube. This will continue continuously until the “IC” detects a pilot flame.

If, after detecting a pilot flame and opening the main gas valve, the “IC” looses pilot flame indication, it will close both the main and redundant gas valves. The “IC” will start the above sequence over until a pilot flame is detected and it will open the main gas valve again.

The “IC” will only allow 16 pilot flameouts and a single rollout switch opening per thermostat cycle. After 16 pilot flameouts or a single rollout switch opening, the “IC” closes both the main and redundant gas valves. The “IC” requires resetting the thermostat or removal of it's power lead coming from the draft motor to reset the “IC” and return it to the above sequence of operation.

At the same time power was supplied to the “DMR” or “DMC”, a parallel circuit activates the time delay (“BT” or “ETD”). The “BT” or “ETD” closes in approximetly 35 seconds and starts the circulating air blower by energizing the blower interlock relay “K3", thus closing the ”K3-2" contact and energizing the blower relay “BR”.

When the heating cycle is complete, “TH-1" opens de-energizing the “IC”, thus closing the redundant and main gas valves. The blower motor and the draft motor continue to run for a short period after the furnace is shut down until the “BT” or “ETD”” opens (in approximately 25 seconds) de-energizing the “K3", ”BR" and “DMR” or “DMC” relays.

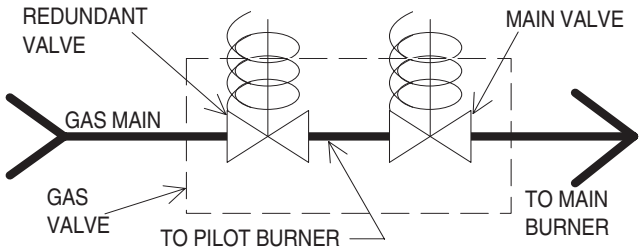



**FIG. 10 -** GAS VALVE PIPING

## SAFETY CONTROLS (Heating)

The control circuit includes the following safety controls:

1. Limit Control (LS). This control is located inside the heat exchanger compartment and is set to open at the temperature indicated in Table 12. It resets automatically. The limit switch, operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the ignition control and closing the main gas valve.
2. Centrifugal Switch (CS-36). If the draft motor should fail, the centrifugal switch attached to the shaft of the motor prevents the ignition control and gas valve from being energized.

**TABLE 10** - LIMIT CONTROL SETTING

| Units (Tons) | Capacity (kW/MBH) | | Limit Control Opens ( °C/°F) |
|---|---|---|---|
| | Input | Output | |
| 3 | 15 / 50 | 12 / 40 | 74 / 165 |
| 4 | 22 / 75 | 18 / 60 | 74 / 165 |
| 5 | 29 / 100 | 23 / 79 | 74 / 165 |
| 6 | 29 / 100 | 23 / 79 | 74 / 165 |

3. Redundant Gas Valve. This valve is an integral part of the main gas valve and is located up stream of the main gas valve. Should the main gas valve fail in the open position the redundant valve serves as a back up and shuts off the flow of gas.
4. Flame Sensor Rod. This sensor rod is located on the far side of the carryover tube. If the ignition control does not receive a signal from the flame sensor indicating that the pilot flame has ignited properly, the main gas valve will not open. If the flame sensor fails to detect the pilot flame during operation of the main burners, a signal is sent to the ignition control to close the main gas valve.
5. Rollout Switch. This switch is located in the burner vestibule. In the event of a sustained main burner flame rollout, it shuts off the ignition control and closes the main gas valve.
6. Auxiliary Limit Switch. This control is located inside the heat exchanger compartment and is set to open at 180°F. It is a manual reset switch. If the auxiliary limit switch trips, then the primary limit switch has not functioned properly. Replace the primary limit switch.

## HEAT ANTICIPATOR SETPOINTS

The anticipator must be set at 0.1 amps. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space.

Reducing the value below the correct setpoint will give shorter "ON" cycles and may result in the lowering of the temperature within the conditioned space.

## PRE-START CHECK LIST

Complete the following checks before starting the unit.

1. Check the type of gas being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Make sure that the vent and combustion air hoods have been properly installed.

# START-UP

## OPERATING INSTRUCTIONS

*CAUTION: This furnace is equipped with an intermittent pilot and automatic re-ignition system. DO NOT attempt to manually light the pilot.*

TO LIGHT PILOT AND MAIN BURNERS:

1. Turn "off" electric power to unit.
2. Turn room thermostat to lowest setting.
3. Turn gas valve knob to "on" position.
4. Turn "on" electric power to unit.
5. Set room thermostat to desired temperature. (If thermostat "set" temperature is above room temperature, pilot burner ignition will occur and, after an interval to prove pilot flame, main burners will ignite).

TO SHUT DOWN:

1. Turn "off" electric power to unit.
2. Depress knob of gas valve while turning to "off" position.

## POST-START CHECK LIST (GAS)

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.
2. Check for correct manifold gas pressures. See "Checking Gas Input".
3. Check the supply gas pressure. It must be within the limits shown on rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas line pressure exceed 13", nor the operating pressure drop below 4.5" for natural gas units. If gas pressure is outside these limits, contact the local gas utility for corrective action.

## MANIFOLD GAS PRESSURE ADJUSTMENT

Small adjustments to the high-fire gas flow may be made by turning the pressure regulator adjusting screw on the automatic gas valve. Refer to Figure 11.

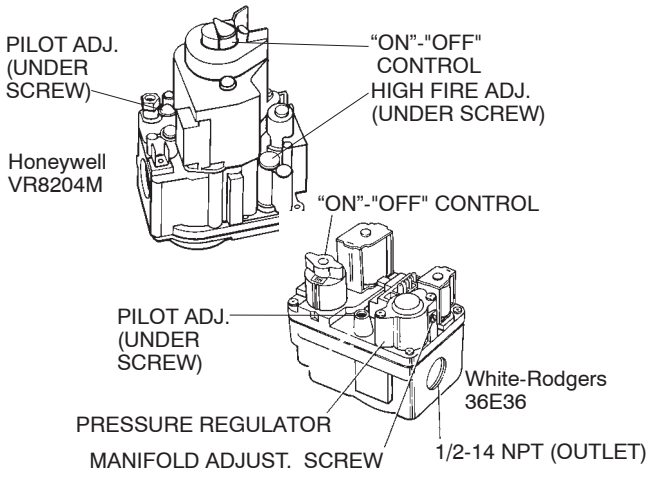



**FIG. 11 -** GAS VALVES

Adjust as follows:

1. Remove the cap on the regulator. (High Fire adjusting screw on valve).
2. To decrease the gas pressure, turn the adjusting screw *counterclockwise.*
3. To increase the gas pressure, turn the adjusting screw *clockwise*.

*NOTE: Check the rating/orifice data label on the blower access panel for the proper manifold pressure of the furnace.*

## PILOT CHECKOUT

The pilot flame should envelope 3/8 inches of the end of the flame sensor. Refer to Figure 12. To adjust pilot flame, (1) remove pilot adjustment cover screw, (2) adjust the screw for the proper pilot flame, (3) be sure to replace cover screw after adjustment to prevent possible gas leakage.

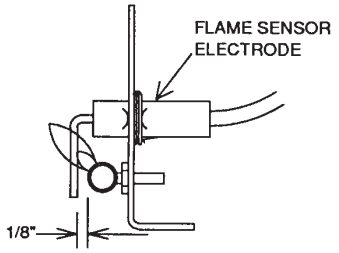



**FIG. 12 -** PROPER FLAME ADJUSTMENT

Put the system into operation and observe through complete cycle to be sure all controls function properly.

## BURNER INSTRUCTIONS

To check or change burners, pilot or orifices, CLOSE MAIN MANUAL SHUT-OFF VALVE AND SHUT OFF ALL POWER TO THE UNIT.

1. Remove the two screws holding either end of the manifold to the burner supports.
2. Open the union fitting in the gas supply line just upstream of the unit gas valve and downstream from the main manual shut-off valve.
3. Remove the gas piping patch plate.
4. Disconnect wiring to the gas valve and spark ignitor. Remove the manifold-burner gas valve assembly by lifting up and pulling back.

Burners are now accessible for service.

Reverse the above procedure to replace the assembly. Make sure that burners are level and seat at the rear of the heat exchanger.

## BURNER AIR SHUTTER ADJUSTMENT

Adjust burner shutters so that a distinct, sharp, blue flame is obtained. Refer to Figure 13.

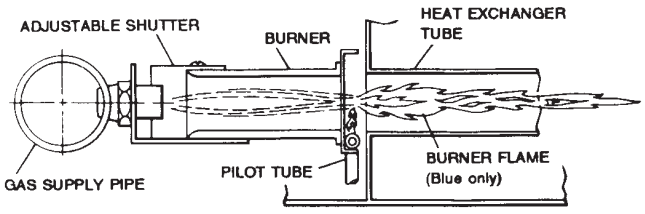



**FIG. 13** - TYPICAL FLAME APPEARANCE

## SUPPLY AIR BLOWER AND TEMPERATURE RISE ADJUSTMENTS

The speed of the supply air blower will depend on the required CFM, the unit accessories and the static resistances of both the supply and the return air duct systems. With this information, the speed for the supply air blower can be determined from the blower performance and accessory static resistance data in Tables 5 through 8.

Knowing the required blower RPM and the blower motor HP, the speed setting for the supply air motor can be determined.

The setting (turns open) for the belt-drive supply air motor pulley can be determined from Table 13.

**TABLE 11** - BELT-DRIVE SUPPLY AIR MOTOR PULLEY ADJUSTMENT

| TURNS OPEN* | BLOWER DRIVE RANGE (RPM) | |
|---|---|---|
| | 5 TON | 6 TON |
| 5 | 850 | 900 |
| 4 | 916 | 960 |
| 3 | 982 | 1020 |
| 2 | 1048 | 1080 |
| 1 | 1114 | 1140 |
| 0 | 1180 | 1200 |

*Pulley can be adjusted in half-turn increments.

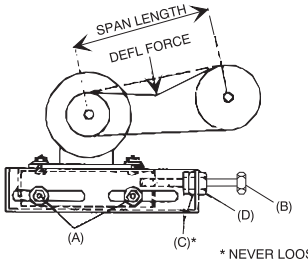
BELT-DRIVE BLOWER

The 5 and 6 ton models with belt-drive blowers have single-speed motors. The variable pitch pulley on the blower motor can be adjusted to obtain the desired supply air CFM. Refer to Table 9 for blower motor and drive data. The tension on the belts should be adjusted as shown in Figure 14.

CAUTION

Procedure for adjusting belt tension:

1. Loosen nut (D) from the motor mount.
2. Never loosen nuts (C) from each other while loosening nut (D).
3. Adjust the tension by turning bolt (B).
4. Do not loosen the four nuts (top and bottom) (A); unless additional tensioning distance is required; immediately re-tighten these bolts if loosened.
5. Use a belt tension checker to apply a perpendicular force to one belt at the midpoint of the span as shown. The deflection force should be applied until a specific deflection distance of 4mm (5/32")is obtained. To determine the deflection distance from normal position, use a straight edge from sheave to sheave as a reference line. The recommended deflection force is as follows:




Tension new belts at the max. deflection force recommended for the belt section. Check the belt tension at least two times during the first 24 hours of operation. Any re-tensioning should fall between the min. and max. deflection force values.

6. After adjusting, re-tighten nut (D) against the motor mount taking care not to loosen nuts (C).

**FIG. 14** - BELT ADJUSTMENT

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

To check the supply air CFM after the initial balancing has been completed:

1. Remove the (two) 8 mm (5/16") dot plugs from the holes located on the filter access panel side of the unit.
2. Insert at least 203 mm (8") of 6.4 mm (¼ in.) tubing into each of these holes for sufficient penetration into the air flow on both sides of the evaporator coil.

   *NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.*
3. Using an inclined manometer, determine the pressure drop across a dry evaporator coil. Since the moisture on an

evaporator coil may vary greatly, measuring the pressure drop across a wet coil under field conditions would be inaccurate. To assure a dry coil, the scroll compressors should be de-energized while the test is being run.

4. Knowing the pressure drop across a dry coil, the actual CFM through the unit can be determined from the curve in Figure 15.

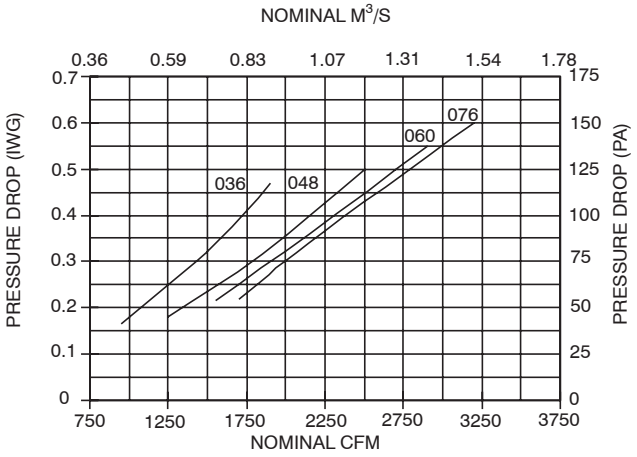



**FIG. 15** - PRESSURE DROP vs SUPPLY AIRFLOW

The temperature rise (or temperature difference between the return air and the heated air from the furnace) must lie within the range shown on the UL or CGA rating plate and the data in Table 2.

If the CFM is above or below the specified value, the supply air motor speed may have to be changed by moving the motor speed tap to another terminal.

$$m^3/s = \frac{0.8 \times kW\ Gas\ Input^*}{1.2072 \times °C\ Temp.\ Rise} \text{ or } CFM = \frac{0.8 \times Btuh\ Gas\ Input^*}{1.08 \times °F\ Temp.\ Rise}$$

* Based on 80% nominal efficiency and gross, or higher, heating value or fuel. Alternately, use 0.9 x gas input based on 90% nominal efficiency and net, or lower, heating value of fuel.

*WARNING: Failure to properly adjust the total system air quantity can result in poor system performance.*

5. After readinds have been obtained, remove the tubes and seal the holes with the 8 mm ($\frac{5}{16}$") dot plugs removed in Step 1.

*NOTE: DE-ENERGIZE THE SCROLL COMPRESSORS BEFORE TAKING ANY TEST MEASUREMENTS TO ASSURE A DRY INDOOR COIL.*

## CHECKING GAS INPUT

NATURAL GAS

1. Turn off all other gas appliances connected to the gas meter.
2. With the furnace turned on, measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter usually has a 1/2 or a 1 cubic foot test dial.
3. Using the number of seconds for each revolution and the size of the test dial increment, find the cubic feet of gas consumed per hour from Table 14.

If the actual input is not within 5% of the furnace rating (with allowance being made for the permissible range of the regulator setting) replace the orifice spuds with spuds of the proper size.

*NOTE To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality (contact your gas company for this information - it varies widely from city to city.)*

**TABLE 12** - GAS RATE - CUBIC FEET PER HOUR

| Seconds for One Rev. | Size of Test Dial | |
|---|---|---|
| | 1/2 cu. ft. | 1 cu. ft. |
| 10 | 180 | 360 |
| 12 | 150 | 300 |
| 14 | 129 | 257 |
| 16 | 113 | 225 |
| 18 | 100 | 200 |
| 20 | 90 | 180 |
| 22 | 82 | 164 |
| 24 | 75 | 150 |
| 26 | 69 | 138 |
| 28 | 64 | 129 |
| 30 | 60 | 120 |
| 32 | 56 | 113 |
| 34 | 53 | 106 |
| 36 | 50 | 100 |
| 38 | 47 | 95 |
| 40 | 45 | 90 |
| 42 | 43 | 86 |
| 44 | 41 | 82 |
| 46 | 39 | 78 |
| 48 | 37 | 75 |
| 50 | 36 | 72 |
| 52 | 35 | 69 |
| 54 | 34 | 67 |
| 56 | 32 | 64 |
| 58 | 31 | 62 |
| 60 | 30 | 60 |

*Example:* By actual measurement, it takes 38 seconds for the hand on the 1-cubic foot dial to make a revolution with just a 100,000 Btuh furnace running. Using this information, locate 38 seconds in the first column in the table above. Read across to the column headed "1 Cubic Foot", where you will see that 95 cubic feet of gas per hour are consumed by the furnace at that rate. Multiply 95 x 1050 (the Btu rating of the gas obtained from the local gas company). The result is 99,750 Btuh, which is close to the 100,000 Btuh rating of the furnace.

**SECURE OWNER'S APPROVAL**: *When the system is functioning properly, secure the owner's approval. Show him the location of all disconnect switches and the thermostat. Teach him how to start and stop the unit and how to adjust temperature settings within the limitations of the system.*

# MAINTENANCE

## NORMAL MAINTENANCE

*CAUTION: Prior to any of the following maintenance procedures, shut off all power to the unit to prevent personal injury.*

Periodic maintenance normally consists of changing or cleaning filters and (under some conditions) cleaning the main burners.

FILTERS - Inspect once a month. Replace disposable or clean permanent type as necessary. DO NOT replace permanent type with disposable.

MOTORS - Indoor fan and outdoor fan motors are permanently lubricated and require no maintenance. Ventor motor is factory lubricated for an estimated 10 year life.

OUTDOOR COIL - Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean coil, be sure power to the unit is shut off prior to cleaning.

*NOTE: Exercise care when cleaning the coil so that the coil fins are not damaged.*

*Do not permit the outdoor air discharge to be obstructed by overhanging structures of shrubs.*

BURNER & PILOT - Periodically (at least annually at the beginning of each heating season) make a visual check of the pilot and main burner flame. If necessary, adjust main burner primary air shutters so that no yellow flame is observed as explained under “BURNER AIR SHUTTER ADJUSTMENT”. If it is not possible to adjust for the proper flame, the burners may need cleaning.

TO CLEAN BURNERS - Remove them from the furnace as explained in “Burner Instructions”. Clean burners with hot water applied along top of the burner.

COMBUSTION AIR DISCHARGE - Visually inspect discharge outlet periodically to make sure that the buildup of soot and dirt is not excessive. If necessary, clean to maintain adequate combustion air discharge.

The manufacture recommends that the furnace system be inspected once a year by a qualified service person.

## CLEANING FLUE PASSAGES AND HEATING ELEMENTS

With proper combustion adjustment the heating element of a gas fired furnace will seldom need cleaning. If the element should become sooted, it can be cleaned as follows:

1. Remove the burner assembly as outlined in “BURNER INSTRUCTIONS”.
2. Remove the roof over the gas heat section.
3. At the top front of the heat section, remove the screws holding the top of the flue collector box. Carefully remove the top of the flue collector box without ripping the adjacent insulation.
4. Lift out the flue diverter baffle.
5. On the inside of the flue collector box, remove the screws holding the flue baffle. Remove the flue baffle.
6. Using a wire brush on a flexible wand, brush out the inside of each heat exchanger from the burner inlet and flue outlet ends.
7. Brush out the inside of the flue collector box and the flue baffles.
8. Run the wire brush down the vent tube from the flue collector end.
9. If soot build-up is particularly bad, remove the vent motor and clean the wheel and housing. Run the wire brush down the flue extentions at the outlet of the vent housing.
10. After brushing is complete, blow all brushed areas with air or nitrogen. Vacuum as needed.
11. Replace parts in the order they were removed in Steps 1 to 5.
12. When replacing the top of the flue collector box, be careful so as not to tear the adjoining insulation.
13. Assure that all seams on the vent side of the combustion system are air tight. Apply a high temperature (+260°C/500°F) sealing compound where needed.

# TROUBLESHOOTING

*WARNING: Troubleshooting of components necessarily requires opening the electrical control box with the power connected to the unit. Use extreme care when working with live circuits! Check the unit nameplate for the correct line voltage and set the volt meter to the correct range before making any connections with line terminals.*

*CAUTION: The wire number or color and terminal designations referred to may vary. Check the wiring label inside the control box access panel for the correct wiring.*

1. Draft motor operates and furnace lights but supply air blower does not start after a short time delay with room thermostat fan switch set to "AUTO".

   a. Set fan switch to "ON". If blower motor runs, go to Step f. If it does not, check to see if line voltage is being supplied to the contacts of the blower relay, "BR", and if the blower relay is pulled in. Check for loose wiring.

   b. If "BR" is pulled in, touch the supply air blower motor housing. If it is hot the motor may be off on inherent protection. Disconnect power to the unit and check the blower motor capacitor. If it is defective, replace it with one of equal capacitance and voltage.

   c. If "BR" is pulled in and the blower motor still does not run, replace the blower motor.

   d. If "BR" is not pulled in check for 24 volts at the "BR" coil. If 24 volts is present, replace the "BR" relay.

   e. If 24 volts is not present at the "BR" coil, check for loose 24 volt wiring back to the relay board. Check control wiring to the room thermostat. If all is fine, replace the relay board.

   f. If the blower motor runs with the fan switch in the "ON" position but does not run soon after the furnace has ignited with the fan switch in the "AUTO" position, check for loose 24 volt wiring between the relay board in the main control box, the Mate-N-Lok connector in the partition between the evaporator and gas heat sections and the time delay "BT" or "ETD".

   g. If all control wiring is fine, check for 24 volts at the relay board. If 24 volts is present, replace the relay board. If 24 volts is not present, replace the "BT" or "ETD".

*NOTE: The furnace may shut itself down on a high temperature condition during the procedure but this will not effect the test if it is done within 5 minutes of furnace shut-down.*

2. The supply air blower operates but the draft motor does not when the room thermostat is set to call for heat and the fan switch in the "ON" position.

   a. The draft motor has inherent protection. If the motor shell is hot to the touch, wait for the internal overload to reset.

   b. If the motor shell is cold with the room thermostat calling for heat, check for line voltage at the motor's Mate-N-Lok connector attached to the evaporator partition. If line voltage is present, replace the draft motor.

   c. If line voltage is not present, check for line voltage at the draft motor relay "DMR" or "DMC" contacts in the main control box and check to see if the "DMR" or "DMC" is pulled in.

   d. If the "DMR" or "DMC" relay is pulled in, check for a loose line voltage connection.

   e. If the "DMR" or "DMC" relay is not pulled in, check for 24 volts at the "DMR" or 24 volts at the "TMC-G" terminal coil. If 24 volts is present, replace the "DMR" or "DM" relay. If 24 volts is not present, check for a loose 24 volt connection back to the relay board and check the connections from the room thermostat to the relay board. If all connections are correct, replace the relay board.

3. The draft motor runs but the furnace does not light and the sparker does not spark.

   a. Check all 24 volt connections from the relay board to and in the gas heat section. Check low voltage connections to the "BT" and "DMC" or "ETD" located in the control box.

   b. If the furnace is hot, it may be out on an over temperature condition, wait for limit reset.

   c. With the draft motor running, check for 24 volts at terminal 24V on the ignitor control (IC) where the red lead from the draft motor attaches. If 24 volts is not present, the centrifugal switch (CS) has not closed or has gone bad. Check the line voltage to the unit, if it is correct replace the draft motor. If line voltage is low call the power company.

   d. If 24 volts is present at the ignitor control, check all control wiring at the ignitor control and the high tension wire to the ignitor. Check that the greeen ground wires from the ignitor control, the gas valve and pilot burner are all intact and making good electrical connection. Check to make sure that the ceramic insulator on the pilot ignitor or sensor is not broken or cracked, if all are intact replace the ignition control "IC".

4. The draft motor runs and the sparker sparks at the pilot burner but the pilot does not ignite and a gas odor is not detected at the draft motor outlet.

   a. Check to make sure gas is being supplied to the unit. Make sure that the gas pressure to the unit is within the proper limits as described in the "POST START CHECK LIST" and that the pilot adjust screw is allowing some flow of gas as described in "PILOT CHECKOUT".

   b. Check all wiring between the ignitor control and the gas valve. Check to make sure the ground connections are intact.

   c. If the wiring is intact, check for 24 volts across terminals "PV" and "COMMON" on the ignitor control. If 24 volts is not present, replace the ignitor control.

   d. If 24 volts is present, remove the pilot burner and remove the pilot orifice from the pilot burner. The orifice is removed in the direction opposite the flow of gas. Inspect the orifice for obstruction. If it is clear, replace the main gas valve.

5. The sparker sparks at the pilot burner but the pilot does not ignite and a gas odor is detected at the draft motor outlet.

   a. Adjust the pilot adjust screw on the gas valve as described in "PILOT CHECKOUT".

   b. Check the supply pressure as described in "POST START CHECK LIST". Make adjustments as necessary.

c. Check the pilot orifice for obstruction as described in Item 4. Clean as needed but the problem should not be the gas valve.

6. The pilot burner ignites but the sparker continues to spark and the main burners do not ignite.
   a. Make the same checks and adjustment as described in Item 5.
   b. Make sure that the pilot burner is not bent or damaged.
   c. Make sure that the ground connections at the pilot burner, gas valve and ignitor control are intact. Check the high tension wire for good electrical connection. If all are intact, replace the ignitor module.
7. The pilot burner lights and the spark stops but the main burners do not light.
   a. Check electrical connections between the ignitor control and the gas valve. If intact, check for 24 volts across terminals “MV” and “COMMON” terminals. If not voltage detected, replace ignitor control If voltage is present, replace gas valve.
8. Furnace lights with roll out or one burner has delayed ignition.
   a. Make sure that the pilot burner is aligned properly with the carryover as described in “PILOT CHECKOUT”.
   b. Make sure that the carryovers on adjoining burners are screwed fast and are level with respect to one another.
9. Main burners light but exhibit erratic flame characteristics.
   a. Adjust air shutters as described in “BURNER AIR SHUTTER ADJUSTMENT”.
   b. Check the main burner orifices for obstruction and alignment. Removal procedure is described in “BURNER INSTRUCTIONS”. Clean or replace burner orifices and burners as needed.

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Heating and Air Conditioning

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